The Commonwealth of Massachusetts

Department of Environmental Management

Division of Forests and Parks

Leverett Saltonstall Building, Government Center

100 Cambridge Street, Boston 02202

GYPSY MOTH POLICY - 1979

RECOMMENDATIONS TO MASSACHUSETTS COMMUNITIES

The following recommendations are provided by the Department of Environmental Management as assistance to communities of the Commonwealth in carrying out control programs.

GYPSY MOTH POPULATION - STATUS

Below is listed those communities in the Commonwealth presently faced with the gypsy moth problem. The listing is the determination made by Department personnel which is based on surveys and professional observation. Following detection of a gypsy moth population it is possible to determine the general health and vigor of the population. It is then possible to classify the particular population as seen below.

BUILDING:

Bernardston
Deerfield
Easthampton
Great Barrington
Greenfield
Hampden
Holyoke
Hudson
Leverett
Monson
Montague
New Salem
Natick
Northampton
Petersham
Sherborn
Shutesbury
Southampton
Sunderland
Ware
Wayland
Wendell
Westhampton
Weston

STABLE:

Abington
Brockton
Canton
Dedham
Douglas
Dover
Dudley
Hanover
Milton
Quincy
Randolph
Rockland
Sandwich
Westwood

DECLINING:

Attleboro	Norton
Berkley	Raynham
Charlton	Rehoboth
Dighton	Sharon
Dudley	Stoughton
Easton	Sturbridge
Foxboro	Taunton
Mansfield	Walpole

BACKGROUND

In 1978 the Department issued a policy statement which basically recommended that no control program using chemicals be employed.

The intent to complete an environmental impact report on the Gypsy Moth was indicated to assist in making a 1979 recommendation to communities.

The draft of this report has been completed and is the basis for the 1979 recommendations.

PROTOTYPE INFESTATION SITUATIONS

Two prototype infestation situations which are the basis for specific recommendations are as follows:

SITUATION A: Populated situations where infestation exists within a distance of five hundred (500) feet from permanent or seasonal dwelling structures. (Campgrounds are included)

SITUATION B: Forested situations where infestation exists but none of the population criteria of Situation A are present.

RECOMMENDATIONS

When control is determined necessary, the following recommendations are offered:

SITUATION A: POPULATED AREAS That the biological agent Bacillus thuringiensis (B.t.) be used in accordance with label instructions. Users are advised to seek certification from the manufacturer or supplier that the material has not been produced over 1 year prior to its date of intended application.

SITUATION B: FORESTED AREAS

1) The procedures recommended for Situation A should be considered before any other alternative is selected.

Publication: # 11481-100-9-8-79-C. R.
Approved by Alfred C. Holland, State Purchasing Agent.

RECOMMENDATIONS (cont.)

2) Should a chemical control agent be selected by the local community by virtue of their statutory authority to do so, the following information on environmental concerns is provided on two available products which should be used according to label directions.

A) Carbaryl (Sevin (R))

B) Acephate (Orthene (R))

A summary of factors relative to these two chemical agents follows:

This summary has been prepared by the firm of Arthur D. Little, Inc. under contract with the Department of Environmental Management, Division of Forests and Parks.

CARBARYL (SEVIN®)

Effects on humans and laboratory mammals:

Carbaryl shows moderate toxicity to laboratory mammals.[1,2] However, there is no evidence of harm to humans from occupational exposure.[3,4] Carbaryl has been shown to be readily metabolized in test mammals.[5] In regard to long-term effects, there is some evidence to suggest that in the human stomach, carbaryl could react with sodium nitrate (found in some foods) to form nitrosocarbaryl which has shown to be a potent mutagen in laboratory tests.[6] Teratogenic effects of carbaryl have also been suggested in laboratory tests on dogs.[7]

Effects on birds:

The acute toxicity of carbaryl to test birds is low.[8,9] However, there is evidence to suggest that carbaryl may impair the reproductive ability of test birds.[10,11] Also, field tests show that carbaryl may decrease available food for birds thus altering feeding activity. Nesting activity does not appear to be affected by carbaryl (at least in 50 acre test plot applications).[12]

Effect on aquatic organisms

Indications provided by field tests and laboratory tests on the effects of carbaryl on fish are inconclusive.[13,14] Further investigation of the literature is particularly important in this regard. In regard to lower aquatic organisms, both field and laboratory tests indicate that carbaryl causes a reduction in some aquatic invertebrate populations.[15]

Other effects:

Carbaryl appears to be acutely toxic to deer.[16] Chronic effects on deer have not been studied. Phytotoxic effects of carbaryl have been shown to occur in some varieties of apples, pears, and watermelons. Boston ivy and some grasses may also be harmed by carbaryl.[17]

Fate in soil and water:

Carbaryl has a short (eight day) half-life in soil. Microorganisms degrade it to simpler hydrocarbons. However, one of the intermediate products is said to be toxic and more persistent than the original compound.[22] Mobility of carbaryl in the soil is unclear although it is likely to be retained by adsorption in surface organic layers, and also move downward to some extent through leaching.[23]

In water, carbaryl degrades more slowly than in soil. Again, one of the intermediate degradation products is more toxic and more persistent than the original compound and has been shown to be particularly toxic to estuarine species.[24]

CARBARYL (SEVIN®) SELECTED REFERENCES

1. U.S. Department of Agriculture. 1975. Environmental Impact Statement, Cooperative 1975 Gypsy Moth Suppression and Regulatory Program.

2. Union Carbide Corporation. 1958a. Chronic oral feeding of Sevin to rats. Internal Report No. 21-88. Cited in Aspects of pesticidal use of Carbaryl (Sevin) on man and the environment. U.S. Environmental Protection Agency. 1975. Office of Pesticide Programs. Draft report, as cited in NAS, 1977.

3. Wills, J.H., E. Jameson and F. Coulston. 1968. Effects of oral doses of Carbaryl on man. Clin. Toxicol. 1:265-271.

4. National Academy of Science. 1977. Drinking Water and Health. Safe Drinking Water Committee. Advisory Center on Toxicology, Assembly of Life Sciences, National Research Council, Washington, D.C.

5. Menzie, C. 1974. Metabolism of Pesticides, An Update. Bureau of Sport Fisheries and Wildlife, Special Scientific Report. Wildlife No. 184.

6. Elespuru, R., J. Setlow and W. Lijinsky. 1973. Nitrosocarbaryl, a new mutagen of environmental significance. Mutat. Res. 21(4):218.

7. Smalley, H.E., J.M. Curtis and F.L. Early. 1968. Teratogenic Action of Carbaryl in Beagle Dogs. Tox. and Appl. Pharmacol. 13: 392-403.

8. Tucker, R.K. and D.G. Crabtree. 1970. Handbook of Toxicity of Pesticides to Wildlife. Denver Wildlife Research Center, Resource Publication No. 84.

9. Hill, E.F., R.G. Heath, J.W. Spann and J.D. Williams. 1975. Lethal Dietary Toxicities of Environmental Pollutants to Birds. U.S. Fish and Wildlife Service, Special Scientific Report. Wildlife No. 191.

10. Sanborn. 1977. Carbaryl, A Review of Selected Literature. Unpublished Report for EPA.

11. U.S. Department of Agriculture. 1975. Environmental Impact Statement, Cooperative 1975 Gypsy Moth Suppression and Regulatory Program.

12. Doane, C.C. and P.W. Sheaffer. 1971. Aerial Application of Insecticides for Control of the Gypsy Moth. Bulletin of Connecticut Agricultural Experiment Station, No. 724.

13. Macek, K.J. and W.A. McAllister. 1970. Insecticide Susceptibility of some common Fish Family Representatives. Trans. of Amer. Fish. Soc., 1:20-27.

14. United States Department of Agriculture. 1975. Environmental Impact Statement, Cooperative 1975 Gypsy Moth Suppression and Regulatory Program.

15. Ibid.

16. Tucker, R.K. and D.G. Crabtree. 1970. Handbook of Toxicity of Pesticides to Wildlife. Denver Wildlife Research Center, Resource Publication No. 84.

17. Thomson, W.T. 1976. Agricultural Chemicals, Book I, Insecticides. Thomson Publications, Indianapolis, Indiana.

18. Doane, C.C. and P.W. Shaefer. 1971. Aerial Application of Insecticides for Control of the Gypsy Moth. Bulletin of Connecticut Agricultural Experiment Station, No. 724.

19. United States Department of Agriculture. 1975. Environmental Impact Statement, Cooperative 1975 Gypsy Moth Suppression and Regulatory Program.

20. Thompson, W.T. 1976. Agricultural Chemicals, Book I, Insecticides. Thomson Publications, Indianapolis, Indiana.

21. United States Department of Agriculture. 1975. Environmental Impact Statement, Cooperative 1975 Gypsy Moth Suppression and Regulatory Program.

22. Sanborn. 1977. Carbaryl, A Review of Selected Literature. Unpublished Report for EPA.

23. Ibid.

24. United States Department of Agriculture. 1975. Environmental Impact Statement, Cooperative 1975 Gypsy Moth Suppression and Regulatory Program.

ACEPHATE (ORTHENE®)

Effect on laboratory animals

In regard to short-term effects, acephate appears to have a low mammalian acute toxicity and dermal toxicity.[1] Regarding long-term effects, insufficient information is available to judge the potential for teratogenic and carcinogenic effects, although some information was available to suggest that acephate may have some mutagenic activity in some species of bacteria.[2]

Effect on birds:

Acephate appears to be somewhat toxic to test birds.[3] The limited field information available suggests that some adverse effects can occur.[4] Further investigation of this literature is necessary.

Effect on aquatic organisms:

Acephate appears to be relatively non-toxic to fish.[5] Insufficient information is available to assess the effect of acephate on aquatic invertebrates.

Fate in soil and water:

In soil, acephate is degraded by microorganisms and has a short half-life of one-half to eight days in a variety of soil types. Degradation in water is slower with a half-life of 20 to 50 days, depending on temperature.[6]

The high solubility of acephate in water may increase its mobility in soil, decrease the likelihood of bioaccumulation in aquatic organisms.

In plants, 90 to 95% of acephate is degraded to innocuous salts.[7] The rest is converted to methamidophos which is reported to be toxic to birds and other wildlife and toxic to bees.[8] Further investigation is necessary.

Other effects:

Acephate is highly toxic to bees and a number of other beneficial insects.[9,10] Also, foliage injury may occur to American Elm, flowering crab, sugar maple, cottonwood, huckleberry, and red delicious apple trees.[11,12]

ACEPHATE (ORTHENE®) SELECTED REFERENCES

1. Chevron Chemical Company. Ortho Experiment Data Sheet, "Orthene®." Undated.

2. Hanna, R.J. and K.F. Dyer. 1975. Mutagenicity of organophosphorus components in bacteria and Drosophila. Mutation Research, 28: Chemical Abstracts.

3. Chevron Chemical Company. Orthene: A New Concept in Insect Control: Information Sheet. Undated.

4. Buckner, C.H., B.B. McLeod and R.R. Lidstone. 1976. Environmental Impact Studies of Spruce Budworm Control Programs in New Brunswick in 1976. Chemical Control Research Institute, Ottawa; Inf. Rep. CC-X; ISS CC-X-135, Chemical Abstracts.

5. Chevron Chemical Company. Ortho Experiment Data Sheet, "Orthene®." Undated.

6. Chevron Chemical Company. Orthene: A New Concept in Insect Control: Information Sheet. Undated.

7. Szeto, S.Y., H.R. MacCarthy, P.C. Olaffs and R.F. Shepard. 1978. Residue in Douglas-Fir Needles and Forest Litter Following an Aerial Application of Acephate. J. Environ. Sci. Health, 13(2):87-103.

8. Thomson, W.T. 1977. Agricultural Chemicals, Book I, Insecticides. Thompson Pub., Fresno, California.

9. United States Department of Agriculture. 1975. USDA Environmental Impact Statement Cooperative 1975 Gypsy Moth Suppression and Regulatory Program.

10. Chevron Chemical Company. Orthene: A New Concept in Insect Control: Information Sheet. Undated.

11. Chevron Chemical Company. Ortho Experiment Data Sheet, "Orthene®." Undated.

12. Chevron Chemical Company. Specimen label. Orthene Forest Spray. Undated.

SUMMARY

The prospects of more than one readily available and effective biological control have become more evident in the past year. The development and registration of Gypcheck (nucleopolyhedrosis-virus) by the U. S. Forest Service produced an agent which promises to provide major economical biological control once it is in commercial production and readily available. Improvement in use and application of B.t. also show much promise.

It is these factors coupled with the basic fact that chemical control agents must always be reviewed on the basis of some environmental damage, that call for the establishment of a 1979 policy by this Department which places the Commonwealth on a course of recommendations that support the use of biological controls. In a state where conflicts between areas of population and the insect are steadily on the increase, this becomes the only valid and responsible long range policy that can be considered.

GILBERT A. BLISS
DIRECTOR OF FORESTS AND PARKS

APPROVED:
Richard C. Kendall
RICHARD E. KENDALL
COMMISSIONER